WILDLIFE HABITAT IMPROVEMENT GUIDE

FOR MINNESOTA YOUTH

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WILDLIFE HABITAT IMPROVEMENT GUIDE FOR MINNESOTA YOUTH

This publication was adapted by Clifton Halsey, extension conservationist-soils from an earlier publication entitled WILDLIFE CONSERVATION GUIDE FOR MINNESOTA FFA CHAPTER ADVISERS AND MEMBERS. The FFA guide was written by James T. Shields and H. Kenneth Neudahl. Mr. Shields at one time headed the Division of Game and Fish of the Minnesota Department of Conservation (now Natural Resources). Mr. Neudahl is editor of FINS AND FEATHERS and was at one time a game biologist with the Minnesota Department of Conservation.

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INTRODUCTION

THIS PUBLICATION OUTLINES projects to increase wildlife and to help rural youth better understand wildlife requirements. The projects will benefit both farms and wildlife.

PROCEDURE – SIX BASIC STEPS

Wildlife improvement projects should follow six steps:

1. Determine the types of wild animals the land is best suited for.
2. Study the life requirements of species selected for management.
3. Prepare a habitat map.
4. Make a general inventory of that area's game species.
5. Determine which of the selected species' life requirements are lacking.
6. Design and implement projects that will improve the wildlife habitat and increase the number of wildlife.

For greater results in one area, several people can work together on a variety of projects. These efforts can be coordinated and assisted by professionals from government agencies and private organizations.

STEP 1
Determine Wildlife Suited To Area

FOUR GAME SPECIES dominate Minnesota's wildlife – pheasants, ducks, ruffed grouse, and deer. Two other game birds, prairie chickens and sharp-tailed grouse, are important in limited areas. To learn more and gain greater satisfaction, work with species suited to your area.

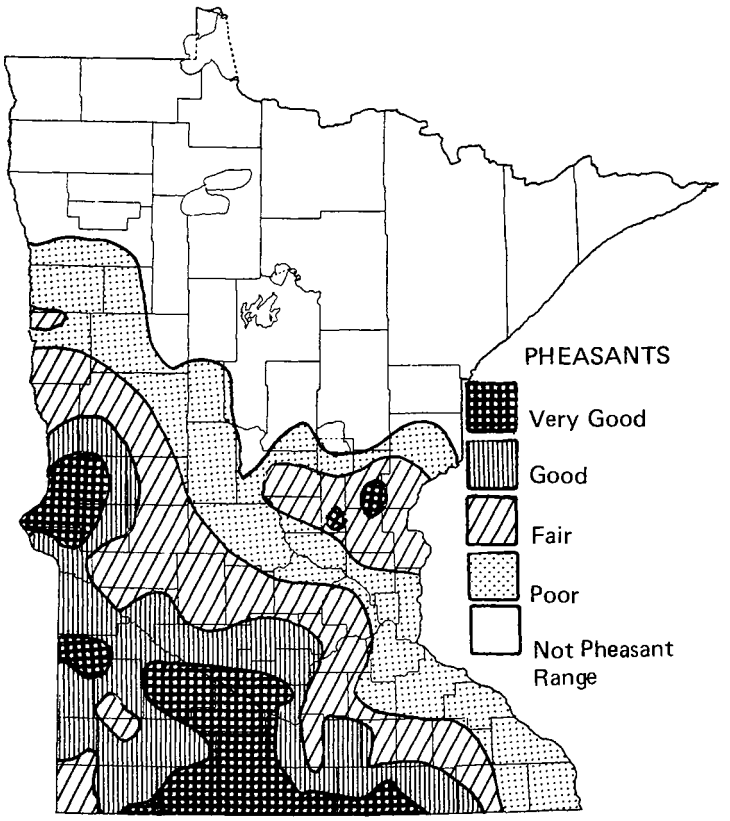
Figures 1 through 4 show distribution of Minnesota game birds in the 1960's. This distribution should be considered before selecting a species to work with.

For example, raising pheasants and improving their habitat in "poor" pheasant range is frustrating and unproductive. In such areas, it would be better to work with grouse or ducks.

Duck distribution is more flexible than shown on the map. This is primarily because several species nest in Minnesota. Even in "low" density zones, projects to help a particular species can be productive.

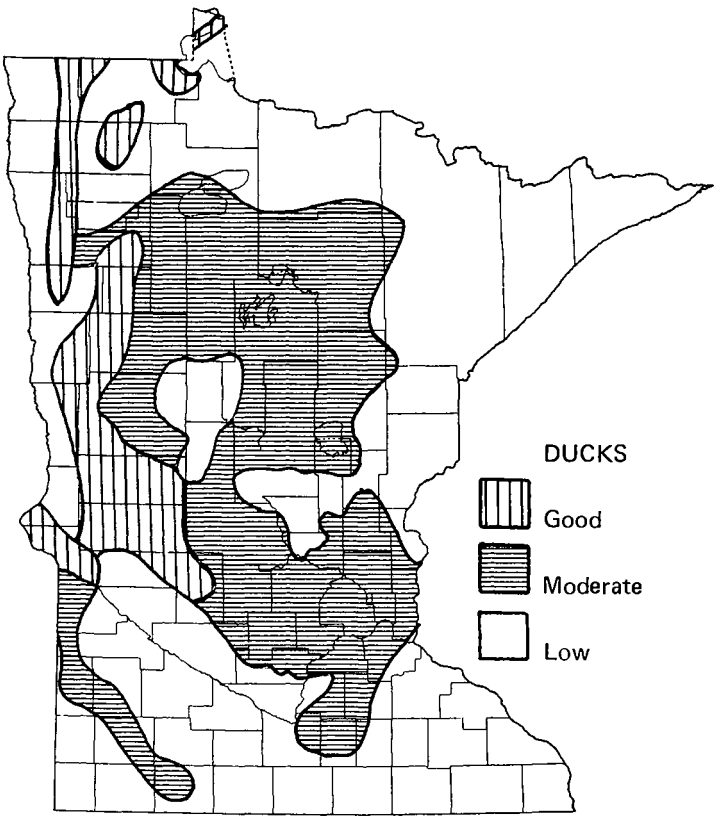
After studying the maps, select one or two species and study their life requirements in as much detail as possible.

Figure 1. Pheasant range in Minnesota



The ring-necked pheasant, introduced from Asia, has adapted quite well to many habitats. In Minnesota, its range includes much land which was original prairie and hardwood forest. The state's most desirable habitat is south-central Minnesota. Pheasants are usually found where intensively managed agricultural land is interspersed with marshland, brushy draws, and dense woodlots.

Figure 2. Duck range in Minnesota



When settlers first came to Minnesota, the areas of high duck production were much more extensive than shown here. An abundance of shallow water areas on poorly drained, unbroken prairies made much of the state prime waterfowl habitat. Now, with intensive farming practices, these areas have shrunk to the present breeding range.

Figure 3. Sharp-tailed grouse-prairie chicken range in Minnesota

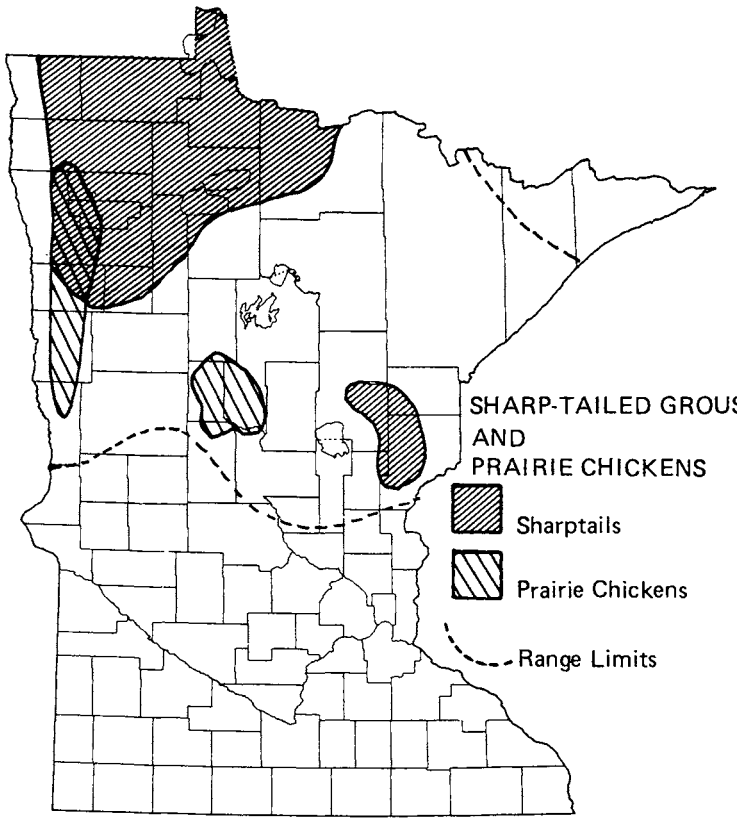
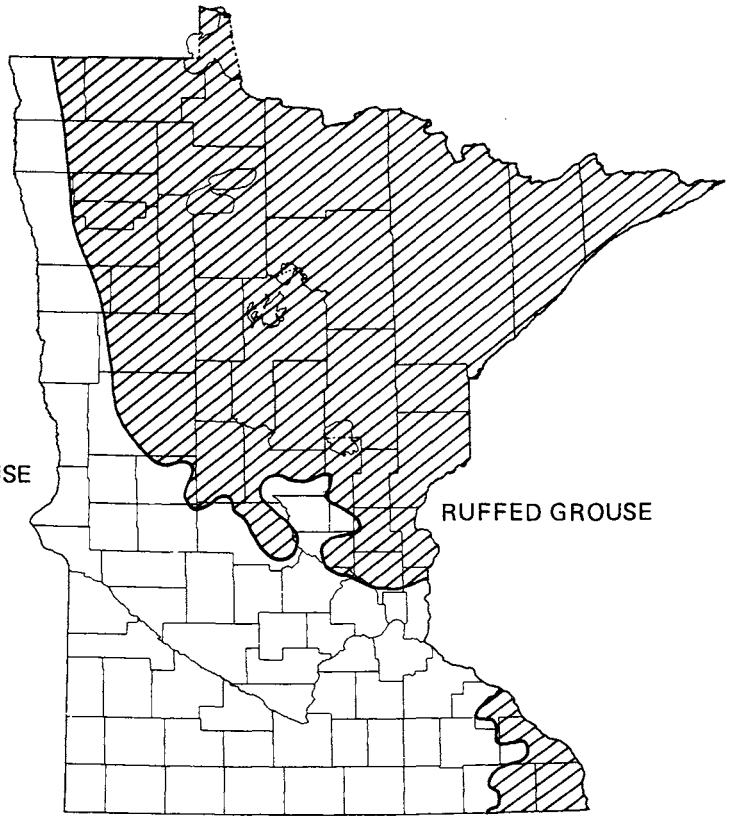


Figure 4. Ruffed grouse range in Minnesota



Sharp-tailed grouse habitat occurs primarily in northwestern Minnesota and in a small area near the Wisconsin border. Grassy fields with scattered willow brush, scattered fields of small grains, and young hardwood forests are places where sharptails are found.

The prairie chicken, once an abundant species in Minnesota, is now scarce. It inhabits a small area along the Red River Valley. This grouse prefers an open prairie habitat with few trees and shrubs. Habitat for both the prairie chicken and sharptail is diminishing in northwestern Minnesota because of the change to agricultural land.

The ruffed grouse ("partridge") favors northern Minnesota's second growth forest areas. In addition, portions of southeastern Minnesota provide good habitat. The best habitat is mixed-age forests with a predominance of hardwoods. Aspen (popple) is a particularly important food source, especially in the winter. Then the flower buds of male trees provide high energy food.

Ruffed grouse habitat also favors deer. Thus, much of Minnesota's deer herd is in the northern forest zone. Substantial numbers of deer are also in the southeastern hardwood forest zone. Deer are less abundant in the remainder of the state, which is the primary agricultural region. Local concentrations may occur where winter cover and standing crops are available.

STEP 2
Study Life Requirements

ANIMALS HAVE CERTAIN requirements in order to grow, reproduce, and maintain their health. Domestic farm animals have all these requirements provided – water, food, shelter, and living space. Wild animals have the same life requirements as their domestic relatives. But "wild" means these animals must find these requirements without direct and daily care by man. In recent years, some of these requirements have nearly disappeared because of man's increased competition for land productivity and because of more efficient harvesting methods.

Photos from top to bottom are a pheasant rooster, a ruffed grouse, a sharp-tailed grouse, and a prairie chicken rooster which is dancing on "booming ground."

(Minn. Dept. of Natural Resources)

(U.S. Bur. of Sport Fisheries & Wildlife)

(U.S. Bur. of Sport Fisheries & Wildlife)

I. UPLAND GAME BIRD HABITAT REQUIREMENTS

Figures 1, 3, and 4 indicate the general ranges of four Minnesota upland game species. Within these ranges, land, water, and climate impose restrictions upon each species.

The type and amount of soil nutrients, such as phosphorous, nitrogen, and calcium, may restrict natural plant communities. Therefore, soil nutrients, directly or indirectly, determine distribution and abundance of each species.

Yearly rainfall, growing season, and soil productivity limit the general range of all upland game birds.

Generally, such factors cannot be controlled. However, we can improve three critical factors to increase upland game bird populations within their ranges. These are:

1. Nesting cover.
2. Winter food.
3. Winter cover.

All upland bird species are short-lived. Normally, only 10 to 20 percent of those hatched live to reproduce. Consequently, the three factors must be met year-round to assure species' continuation.

Also important are brushy or weedy travel lanes between feeding and roosting areas. Loafing cover of thickets and marshes and also grassy brood cover should be available.

Ideally, to manage the whole state for maximum carrying capacity of each upland bird species, Minnesota would be developed into a checkerboard of small management units. These units would provide nesting cover, food patches, cover plots, and other requirements.

Of course this is not practical. Wildlife management must fit with other land uses.

The wildlife management unit, however, is the KEY to increasing wildlife abundance. Basic requirements for pheasants, ruffed grouse, and prairie grouse are outlined in the following sections.

A. Pheasants

1. *Nesting Cover*

In general, hen pheasants use nesting areas having a moderate density of vegetative cover. Mixtures of grasses and legumes are ideal. These are especially attractive to early nesting hens if the previous season's growth remains over the winter. Most nests are near the "edge" between different habitat types. Hayfields, mainly alfalfa, and roadsides are most often used. Over 25 percent of pheasant nests are found in roadsides, even though roadsides comprise only 2 percent of land area. Pastures and nonagricultural areas, such as fence rows and marsh edges, are less often used.

Hayfields provide ideal cover early in the season. Unfortunately, many nests and hens are destroyed during the first mowing. When possible, mowing should be delayed until July 15.

Small grain fields and marsh edges provided many nesting sites in the early 1940's, but these areas have become increasingly scarce.

Nesting may occur as early as mid-April. The egg laying peak occurs in mid-May. A hen takes about 15 days to lay an average of 10 eggs. Hatching occurs about 23 days after incubation begins.

2. *Winter Food*

Corn and soybeans are pheasants' primary winter foods. In many areas, fall plowing and efficient harvests have made these foods unavailable during winter.

If food is limited, a 1- or 2-acre food patch will sustain an area's pheasants through the winter.

3. *Winter Cover*

In winter, pheasants will use almost any dense vegetation not covered by snow.

Shelterbelts and woodlots are heavily used if they are thick enough and large enough to stop drifting snow. Wooded areas are used primarily in late winter when other areas are covered with snow. Heavy weeds and cattail sloughs also provide good roosting unless they become snow-filled.

Pheasants forced to roost in inadequate cover are susceptible to exposure and predators. Those that survive enter the breeding season in poor condition. The result is poor reproductive success and high summer mortality, especially among hens.

To avoid excessive winter stress, dense cover sites should be located less than 1/2 mile from food patches.

The exact winter food-to-cover ratio is not known. In general, a 1- or 2-acre cover site with a 2-acre food patch can winter 50 pheasants.

Suggested Reading

(Refer to list at end of this publication):

7. Rugged Ringneck of Minnesota
18. The Ringnecked Pheasant in Minnesota
34. The Ringnecked Pheasant
25. Recommendations for a Scattered Wetlands Program of Pheasant Habitat Preservation in Southeast Wisconsin

B. Ruffed Grouse

1. *Nesting Cover*

Throughout Minnesota's primary ruffed grouse range, male aspen trees appear essential to year-round grouse survival. Buds of the male aspen provide high energy food that grouse require to survive winter and to produce eggs. The female aspen is no more important than other trees.

Most male grouse select drumming logs within sight of male aspens. Hens, after mating, seek a suitable group of male aspens as a feeding site near their nests.

Generally, nests are located close to forest openings. They are usually by the bases of trees or old stumps in areas relatively free of dense undergrowth. A hen will lay an average of 11 eggs which hatch about 23 days after incubation begins. The peak of the hatching season occurs about the 2nd week in June.

2. *Winter Food*

During most winters and springs, flower buds of male aspens are the most important food source. Hazel, birch, and ironwood catkins are sometimes used heavily, but they are not as nutritious. Abundance of grouse on each 40 acres is closely related to the quantity and quality of food on that land. Excess food may exist in one small area, but because of territorial behavior, resident birds will not allow other grouse to use it. Thus, a scattering of food sources is essential.

Most wintertime feeding is done in aspens over 30 years old. This indicates rotational cutting is needed for continual renewal of aspen stands. Clearcutting blocks as small as 5 acres provides continuous rotation in areas small enough to support maximum numbers of grouse. Such timber management will provide the most efficient interspersion of new forest openings, dense sapling stands for drumming sites, pole stage stands for nesting cover, and mature trees for winter food.

3. *Winter Cover*

In areas where snow is powdery and at least 1 foot deep most of the winter, ruffed grouse will burrow beneath the snow. Powdery snow provides insulation so that the birds can conserve energy. It often is 30° to 50° F. warmer under the snow than in the open air. During severe cold spells, the birds stay under the snow most of the time, coming out to feed for less than an hour once or twice a day.

Mortality sometimes occurs when crust forms on the snow and birds are either trapped beneath the snow or cannot penetrate the crust to find refuge.

Suggested Reading

(Refer to list at end of this publication):

12. A Discussion of Ruffed Grouse Management Problems in Minnesota
17. Recommendations for Management of Ruffed Grouse Habitat in Northern Minnesota
19. Ruffed Grouse in Minnesota
32. Ruffed Grouse

C. Sharp-tailed Grouse and Prairie Chickens

1. *Nesting Cover*

Sharp-tailed grouse and prairie chickens are related species with limited distribution in Minnesota. Both game birds are associated with original prairie and old field plant communities such as those on abandoned farmsteads.

Sharptail nesting habitat is on the prairie's edge where grasses and other nonwoody plants are mixed with young willows. Nesting areas commonly contain 25 to 50 percent brushland.

Prairie chickens use the more open areas of the prairie. They prefer limited woody cover.

Both species must have extensive open areas of sparse vegetation for dancing and mating.

Hens lay an average of 11 to 12 eggs which hatch after 23 days of incubation. The laying season peak usually occurs about mid-May.

2. *Winter Food*

During winter, both species usually feed on corn and other small grains. The sharptail shows greater preference for cereal grains. In boggy areas, the sharptail may also feed on buds of the dwarf white birch (bog birch).

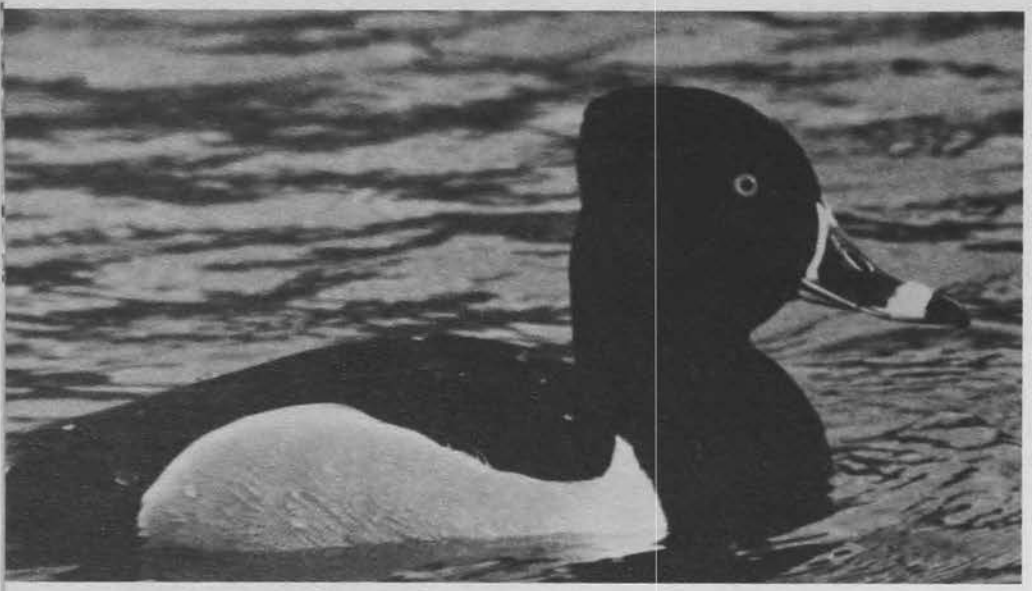
3. *Winter Cover*

During the winter months, prairie grouse usually concentrate in flocks of 75 to 100 birds. Sharptails frequent aspen and birch stands, while prairie chickens seek refuge in woody cover or dense vegetation on the prairie.

Suggested Reading

(Refer to list at end of this publication):

8. Prairie Grouse
20. Sharptailed Grouse in Minnesota



(Photos are courtesy of U.S. Bur. of Sport Fisheries & Wildlife)

II. WATERFOWL HABITAT REQUIREMENTS

Figure 2 indicates the extent and quality of Minnesota's duck breeding range. Over the past century, this range has greatly diminished. Fertile soil, which provided high yields of aquatic plants and food organisms for ducks, can also provide high crop yields for man.

By 1930, most wetlands were drained in southern Minnesota counties. It's presently estimated less than one-third the original waterfowl habitat remains.

It would be impossible to completely restore the prairie pothole region. However, certain habitat requirements can coincide with agricultural use.

Since ducks are migratory, Minnesota habitat requirements must be met during the spring, summer, and fall. Therefore, we must improve two critical factors to increase duck populations. These are:

1. Adequate upland nesting cover.
2. Wetland water areas.

Top left: This mallard drake and hen are dabbling ducks. Mallards are the most plentiful ducks both in Minnesota and the United States. Top right: This is a male blue-winged teal. Blue-winged teal are surface-feeding, dabbling ducks and are common in Minnesota. Second row, left: The ring-necked duck is sometimes called the bluebill. Such ducks are divers and are common in Minnesota's forest areas. Second row, right: The lesser scaup is also called a bluebill. This bird is a diving duck that migrates through Minnesota. Lower left: The gadwall is a dabbling duck appearing in small numbers in western Minnesota. Third row, right: This shoveller drake and hen are dabbling ducks. Shovellers are also called spoonbills. They prefer shallow prairie marshes and occur in small numbers in Minnesota. Fourth row, right: Canada geese mate for life and are devoted parents. Under specialized management, Canada geese are increasing in Minnesota.

A. Dabbling Ducks

1. *Nesting Cover*

During the spring breeding season, Minnesota's two most abundant dabbling ducks (the mallard and the blue-winged teal) nest on uplands near or adjacent to water.

Dabbling ducks prefer nesting sites close to water, but they may locate their nests as far as 1/2 mile away. Alfalfa-grass mixtures cut after July 15 are good cover for initial nests of both species. Lightly grazed pastures adjacent to open water are also used, especially by teal.

Usually, most mallards will nest by the 1st week in May. If nests are destroyed, renesting attempts may extend into July.

The best nesting sites are in areas where a mat of dead grass has been formed. Mallards prefer clumps of dead vegetation which remain upright and form a "teepee" over the nest. The first nesting attempt, the mallard will lay 10 to 11 eggs which require 1 day each to lay. An additional 26 to 28 days of incubation is required for hatching.

Blue-winged teal arrive and nest later than mallards. Most initial nests are completed the 3rd week in May. The average clutch is 11 eggs with a 23-day incubation period.

Wood ducks nest in hollow trees, usually hardwoods. They also use artificial nesting boxes. Nest sites may be as far as 1/2 mile from water, but they are usually located near the edge of a lake or stream. Peak nesting occurs in early May. The usual clutch is 10 to 15 eggs with 28 to 31 days' incubation.

2. *Wetland Water Areas*

Dabbling ducks prefer ponds or marshes in which fertile water has both plant and animal food. They seek wetlands having fringe of emergent bulrushes or other plants to provide cover for young ducklings.

These ducks "tip up" to feed off the bottom. Thus they need considerable areas of water less than 2 feet deep. Submerged water weeds are food for adults, and the insects and snails these plants harbor provide high protein food for ducklings.

B. Diving Ducks

In general, diving ducks such as the redhead, ring-necked duck, and ruddy duck breed closer to open water than do dabbling ducks. Frequently, nests are constructed on floating mats among cattails or on bulrushes along ponds.

In northern Minnesota's wooded areas, the ring-necked duck is most likely to use forest ponds. The goldeneye prefers larger lakes. Goldeneyes normally nest in hollow trees, but they will readily accept nesting boxes. Ring-necked ducks nest in emergent vegetation near or over water.

Diving ducks do not need large expanses of shallow water since they can dive for food. However, they prefer lakes fringed with emergent plants for shelter and cover.

Suggested Reading

(Refer to list at end of this publication):

33. The Mallard

White-tailed deer are much more prevalent now in Minnesota than they were before the forests were harvested. Twin fawns are more likely to be born if food has been plentiful.

(U.S. Bur. of Sport Fisheries & Wildlife)

III. DEER HABITAT REQUIREMENTS

Minnesota's deer range has not always been so extensive. Before 1860, deer were extremely rare in dense evergreen forests of spruce, fir, and pines of the northeastern counties. At that time, the most abundant big game in the northeast were moose and woodland caribou.

Only after mature coniferous forests were logged and the cutover lands burned did white-tailed deer become numerous in northern Minnesota.

This cutting and burning encouraged a lush growth of shrubs and young, second-growth hardwoods. Both are favorite foods of the whitetail.

As the northern habitat improved, conditions became less favorable in southern counties. Because of land clearing, intensified farming, and uncontrolled hunting, whitetails had all but disappeared from southern Minnesota by 1880.

From 1900 to the late 1930's, deer increased in northern Minnesota to such an extent that they were overbrowsing. They had exceeded the land's carrying capacity. The deer consumed not only their present food supply but had eaten into their future supply as well.

Minnesota's deer herd reached its peak population in the mid-1930's. Since then, the herd has fluctuated at a somewhat lower level, depending upon winter weather and gradual changes in forest. The combination of too many deer in the past, maturing second-growth trees, conifer regeneration, fire control, and reforestation with pines has kept the herd from regaining its former abundance.

Since 1933, game administrators and legislators have recognized that, in heavily forested areas, deer hunting seasons are needed each year to keep the herd within limits of the land's carrying capacity. More important, however, is the fact that carrying capacity can be increased by improved habitat.

Summer and fall are times of food abundance, but winter and early spring are often times of shortage and subsequent malnutrition. Therefore, habitat management should help supply:

1. Winter food.
2. Winter cover.

Here are white-tailed deer requirements during winter.

A. Northern Forested Area

Since the 1930's, much of the northern forest has become more mature. In many places, spruce and balsam have replaced shrubs and deciduous trees which provided the best deer food. In such regions, availability of nutritious winter food is more critical than winter cover.

1. *Winter Food*

Winter food preferences are related to the food available. In early winter when there is little snow, nonwoody plants such as wild astor and goldenrod are favored foods. As snow depths increase, deer turn to the more readily available woody plants.

White cedar is a highly preferred browse plant. It's the only native species that deer can feed on exclusively and maintain their weight for 60 consecutive winter days. In many Minnesota deeryards, however, most cedar within reach of deer has been eaten. New growth and seedlings are consumed as fast as they appear.

Over much of northeastern Minnesota, mountain maple is the most important and nutritious winter food. It can withstand heavy browsing and will grow new sprouts to replace those eaten. Red maple is another favorite food. It can withstand heavy browsing, but it's less abundant than mountain maple.

Red osier dogwood is an excellent deer food, but it doesn't withstand heavy browsing. Heavy use will soon reduce it to a club-topped plant providing little or no food.

Black ash is found in central Minnesota's wet lowlands. Deer regularly use sprouts from old ash stumps, and this is an important addition to their winter diet.

Mountain ash is avidly eaten, but it is not plentiful enough to be important.

Balsam fir affords excellent winter cover, but it has limited food value.

The American and beaked hazel are common plants in upland forests. However, they are not readily available except during warm, open winters when deer can travel easily.

Alder is common in lowland deeryards, but it's only browsed in winter when more palatable foods are used up. Alder and black spruce are probably the poorest of all Minnesota deer foods.

Food plants in or adjacent to most Minnesota deeryards are rated according to deer preference in table 1.

2. *Winter Cover*

Like most animals, deer avoid large areas featuring only one type of tree or shrub. They prefer a scattering of various kinds of cover and openings. In extensive forests, deer frequent the edges of lakes, swamps, streams, and roads. Only during a severe winter or when heavily hunted do deer remain deep within an extensive forest.

Both sexes and all ages congregate in traditional "deeryards" during the winter. The whitetail usually returns to the same wintering area year after year. Most of these yards are lowland cedar or spruce swamps offering protection from wind and driving snow. Unfortunately, many of these areas were severely overbrowsed in the mid-1940's. Many do not contain enough nutritious food to last the winter.

B. Agricultural Area

South and west of the northern forest area, deer are found in every county, even where woody cover is limited to scattered groves or along streams and rivers. In these regions, deer are more vulnerable to hunting. Hunting seasons are usually more limited than in the dense northern Minnesota forests. In the agricultural region, deer also have different food habits. Large herds are not uncommon in winter. Damage to standing corn can be serious. Damage to orchards has caused consternation to fruit growers. A short hunting season in these areas has sufficiently reduced the herd and restricted crop damage.

Deer numbers can be increased (and still be compatible with agriculture) if winter food and cover requirements are improved.

1. *Winter Food*

Deer herds in agricultural counties rely mainly on corn, soybeans, and alfalfa. They also relish tender new growth and buds of fruit trees.

2. *Winter Cover*

To escape winter elements in open farm country, deer seek shelter in tree-lined bottomlands along streams and rivers, field woodlots, shelterbelts, willow thickets, and large marshes.

Table 1. Classification of some Minnesota plants eaten by deer based on deer preference.

GOOD QUALITY Highly nutritious foods which deer prefer	MEDIUM QUALITY Moderately nutritious foods which deer often use	POOR QUALITY Low-value foods used only when better foods are unavailable
White cedar	Hard maple	Honeysuckle
Red osier dogwood	Black ash	White pine
Mountain maple	Mountain ash	Balsam fir
Staghorn sumac	Chokecherry	Red pine
Oaks (browse & acorns)	Basswood	Tamarack
Alternate-leaved dogwood	White birch	Alder
	Some willows	Bog birch
Red maple	Hazel	Black spruce
Juneberry	Aspen	Jack pine

Suggested Reading

(Refer to list at end of this publication):

1. Big Game in Minnesota
9. The White-Tailed Deer
21. The White-Tailed Deer in Minnesota

STEP 3
Inventory Habitat

Before beginning a habitat improvement program, prepare a habitat inventory map of at least 1 square mile that includes your farm and adjacent lands. A habitat map will indicate presently available requirements for desired game species.

Materials

Aerial photos: (available on loan from the nearest field office of the Minnesota Department of Natural Resources' Division of Lands and Forestry or the Agricultural Stabilization and Conservation Service).
United States Geological Survey 1:24,000 quadrangle map: (available from Denver Distribution Section, U.S. Geological Survey, Denver Federal Center, Building 41, Denver, Colo. 80225, or Hudson Map Company, 1506 Hennepin Avenue, Minneapolis, Minn. Purchase price necessary).
Soil Conservation Service soils map: (available on loan from the nearest Soil Conservation Service field office).
County map: (available from the nearest county office or Minnesota Department of Highways).

Method

Prepare a map of all land within a 1/2 mile radius of your farm or project area (see figure 5). This map should be as detailed as possible, using quadrangle, soils, and county maps in addition to aerial photos.

Use a scale that permits accurate location of small land tracts. Maps using 1 inch to 200 feet are large and easy to use. A conservation plan may have been developed for the land by the Soil Conservation Service. This provides an excellent starting point.

The following areas should be included on a general habitat map: grassland; brush; second-growth forest; mature forest; grazed woodlot; pasture; cropland; open water; and marsh areas. Also include buildings, fencelines, farm groves, windbreaks, roads, and ditches. Identify crops and, if possible, the sequence of rotation.

Compile a data sheet (see figure 5) including the percentage breakdown of different habitat areas. The map and data sheet will be used to start a habitat improvement program for the desired game species.

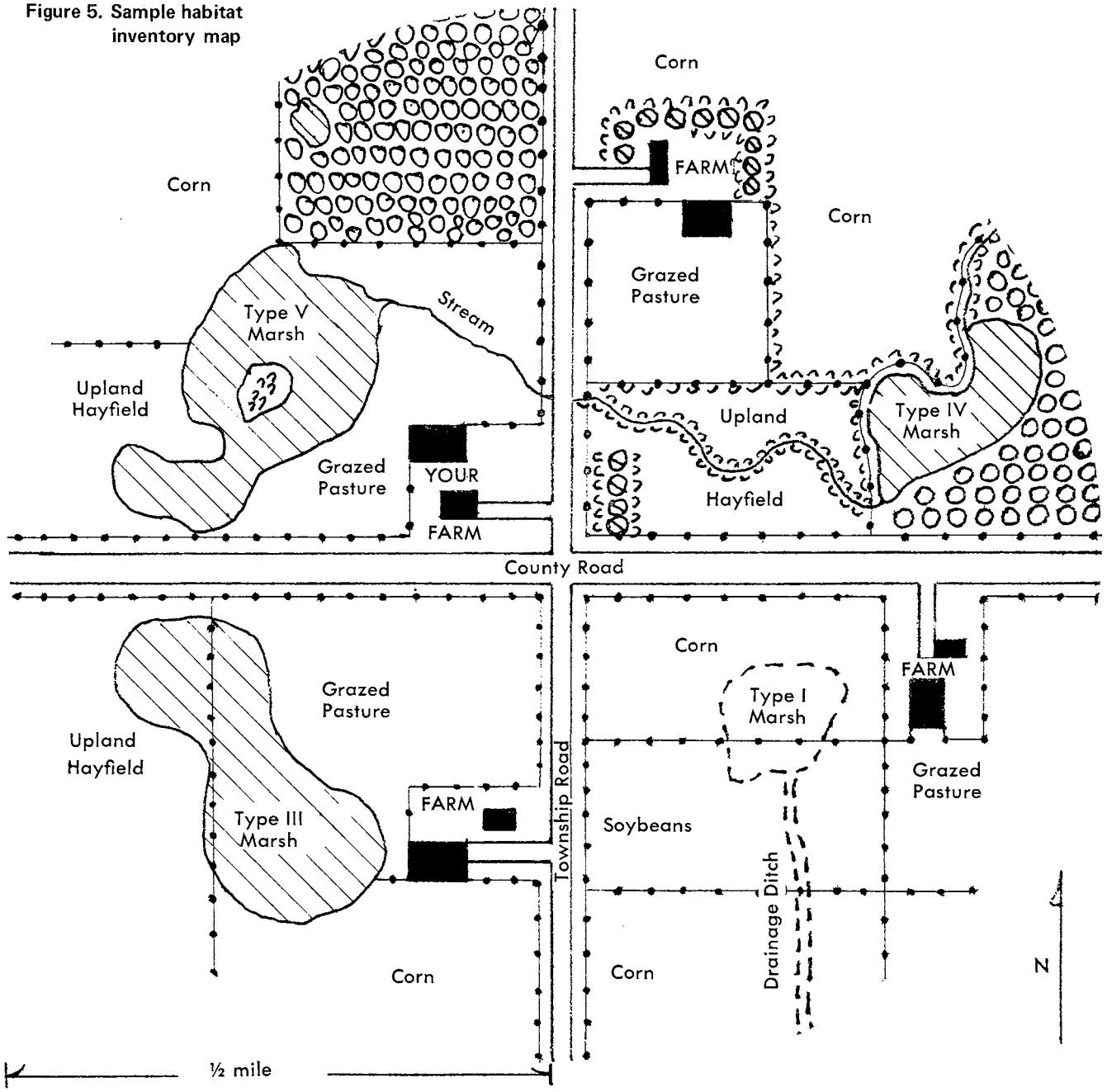
After making this inventory map, study it in relation to desired game species' habitat requirements – nesting cover, food, winter cover, and range limitations.

Suggested Reading

(Refer to list at end of this publication):

3. Key to Common Aquatic Plants
28. American Wildlife and Plants, A Guide to Wildlife Food Habits

Figure 5. Sample habitat inventory map



Types of Habitat	Acres	Percent of Area
1. Upland Nesting Cover (upland hayfields, grasses, legumes, roadsides, grazed pastures)	186	37%
2. Woody Cover (small dense stands of trees, shrubs, shelterbelts, etc.)	6	1
3. Escape Cover (fence rows, travel lanes)	6	1
4. Wetlands and Water Areas (marshes, sloughs, farm ponds, lakes, etc.)	64	13
5. Croplands (corn, soybeans, etc.)	173	33
6. Woodlots (mature or marketable aspen, oak, etc.)	45	9
7. Other (roads, buildings, etc.)	32	6
Total	512	100%

LEGEND

- Wire Fence
- Farm Building
- Woody Brush
- Hardwood Trees
- Conifer Trees
- Water Area

STEP 4
Inventory Game Species

Several methods have been developed to estimate animal numbers. They include visual sightings, sound data (crowing and drumming counts), nest counts, brood counts, and hunters' kill reports. A census can provide an estimate within 20 percent (plus or minus) of the actual number.

Through past experience, you may be familiar with the wildlife species and their general abundance on the land surrounding your farm. To establish habitat management, you will not need to know the exact number of wildlife. However, it will be helpful to estimate whether the desired game species is abundant, scarce, or nonexistent.

Before attempting a census, contact your local, state, or federal game manager. Have him describe the type and abundance of wildlife on or near your area. Perhaps he is planning a detailed census, and you may be able to help him.

Otherwise, plot census routes on the habitat inventory map. Depending on time, labor, and the amount of heavy cover, distance between the transect (census) routes will vary. For a visual count of the maximum number of a game species, a late August pre-hunting season date could be chosen. A hunting dog will help flush game birds. At this time of the year, upland game birds are more dispersed. You must find preferred cover and feeding areas during different times of the day. For example early in the morning, pheasants may concentrate for gravel grit near roadsides. They may return to cornfields and brushy cover to feed and loaf during midday. They may fly to roosting trees just before nightfall. Your census survey routes must take the birds' habits into account.

To estimate a *deer* population within an area, pellet droppings can be counted as in this example.

1. Ten plots, each 1/100th acre in size (20′ x 20′) are cleared of pellets.
2. One hundred days later, plots are revisited and pellet groups are counted.
3. Assume 13 groups are counted on the 10 plots.
4. Defecation rate is approximately 13 pellet groups/day.
5. Calculations:

   Pellet groups per acre (13 pellet groups per 10th acre × 10) = 130

   Deer days per acre: 130/13 = 10

   Deer per acre: $\frac{10 \text{ deer days}}{100 \text{ days}}$ = .1 deer/acre

   Deer per square mile = 640 acres × .1 deer/acre = 64 deer

How does game abundance on your sample habitat compare with these estimates of pre-hunting season density on Minnesota lands managed intensively for wildlife:

Game Species	Low to high numbers per square mile on good habitat
Pheasants	50-300
Ruffed grouse	25-150
Sharptails	10-50
Deer	10-40

Another census could be run in the spring, using crowing or drumming counts. For cock pheasants, peak crowing occurs in mid-April. The best time to count the number of crowing cocks is shortly after sunrise. Most will have quit after 1½ hours.

Station yourself in a central location on good upland courting and nesting areas. Locate the different crowing cock pheasants on your habitat map, and record the number. You may notice that one cock crows more loudly and more frequently than others. This is the dominant cock and may suppress other males from crowing. In good weather, the average time between two crows is about 2 minutes.

If more than one courting and nesting area occurs within a 1/2 mile radius of your farm, survey these areas on different mornings.

To estimate the total spring breeding population, multiply the number of crowing males by 4 (the normal spring sex ratio is one cock pheasant to three hens).

From mid-April to May, a similar procedure can be used for ruffed grouse. Male grouse will beat their wings on territorial drumming sites once every 4 minutes shortly before and after sunrise and sunset. For an estimate of the spring breeding population, multiply the number of drumming males by 2 (the normal spring sex ratio of ruffed grouse is one male to one female).

To best estimate sharptail and prairie chicken numbers, count displaying cocks on their traditional spring dancing grounds. Usually there is a slight excess of males in the spring. For a conservative estimate of the total population, multiply the number of cocks by 2. Peak "booming" activity occurs shortly after the snow has melted in early spring. Booming may start in late March and gradually taper off until June 1. The display begins about an hour after sunrise and continues 3 to 4 hours.

All spring population estimates should be less than pre-hunting season numbers. This is because of losses from game harvest and natural causes.

Spring is also the best time to inventory waterfowl. Visual counts of breeding pairs on wetland areas will give the best estimates. Breeding densities can vary widely, but one breeding pair per 10 acres of water is considered good.

Top, left: Sharp-tailed grouse like intermixed open prairie and brushland. Top, right: This is a Type V wetland marsh, an open fresh water marsh located in a Minnesota prairie area. Lower left: A shoveller hen prefers prairie areas having shallow marshes. Lower middle: This sharp-tailed grouse is performing his mating dance. Middle right: White-tailed deer will take advantage of a prairie woodlot for food and shelter. Lower right: This half-grown family of blue-winged teal are feeding on insects and water plants.

(U.S. Bur. of Sport Fisheries & Wildlife)

(U.S. Bur. of Sport Fisheries & Wildlife)

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(U.S. Bur. of Sport Fisheries & Wildlife)

STEP 5
Determine Habitat Needs

Survey your study area. Look for nesting cover, winter food, and winter cover. Take note of specific food and cover plant species. On tracing paper, make a coded overlay of these areas. Tabulate them as percentages of the whole area.

Ideally, the inventory maps and percentage tabulation for nesting cover should be made in early May and again in late June. This is so changes can be noted. If only an autumn survey is possible, estimate spring nesting cover. Be sure to check your estimates the next spring.

A winter food and cover survey should be taken in late fall or early winter.

Combine all your information and compare it with the sample habitat maps and data sheet. From this and your previous study of individual species' habitat requirements, you can determine what is lacking or needs improvement.

The ideal habitat management unit cannot be repeated on every acre, but ask yourself these questions:

1. Is it possible to devote an acre or more of marginal farmland to permanent nesting cover?
2. Can roadside mowing be delayed until July 15?
3. Are gullies barren and unprotected? Is it possible to plant winter cover there for upland game birds or to fence these areas from grazing so they can grow back to native brushland?
4. Would high (6- to 8-inch) mowing, harvesting hay in mid-July, clearcutting small blocks in the "north 40," or minimum tillage provide better habitat for upland birds, ducks, and other wildlife?
5. Could diverted acres be seeded to establish and maintain a legume-grass cover crop?
6. Could trees, shrubs, or winter food crops be planted to improve habitat?
7. Can you apply for habitat improvement cost-sharing incentives through the ASCS (Agricultural Stabilization and Conservation Service)?

At this point, you will need the advice and perhaps financial assistance of the Soil Conservation Service, Agricultural Stabilization and Conservation Service, State Department of Natural Resources, or Federal Bureau of Sport Fisheries and Wildlife.

After the final management scheme has been made, divide the plan into phases. Use tracing paper overlays for each phase. For example:
Phase I – Plant shelterbelt around farm, do spring plowing, delay roadside mowing;
Phase II – Blast a small pothole, fence cattle from existing wetlands, improve upland nesting cover;
Phase III – Thin marketable aspens, cut and pile, etc.

Plan long-term restoration. Habitat development is a long-term investment; full benefits may not be seen for several years.

A farm provides livelihood for its owners. Review your habitat plan, and consider the following questions:

1. What is the income on marginal land designated for management changes? Are local sportsmen interested in contributing to these changes? Is there other recreational potential on these areas?
2. What is the cost of changing such practices as fall plowing, early hay mowing, etc.?
3. What is the total cost of the habitat development?

Many habitat conservation practices can be carried out with little or no cost to the landowner.

STEP 6
Implement Wildlife Projects

I. PHEASANT PROJECTS

A. Nesting Cover

1. *First Year*

Nesting cover crops may be planted under land retirement programs. A mixture of legumes (particularly alfalfa and bromegrass plantings) produces early nesting cover. This is highly attractive to pheasants and to waterfowl such as mallards and teal. The nesting cover should be established for at least 2 years.

Procedure:

a. Small grains are seeded as a nurse crop to establish a perennial cover of alfalfa and bromegrass. If seeded early, oats is an especially good nurse crop. It will provide good nesting cover the 1st year.

b. The small-grain nurse crop should be seeded at not less than 1½ bushels per acre to provide maximum cover for nesting and soil conservation.

c. The small-grain crop variety should be short to medium height at maturity with at least medium straw strength so it will not lodge.

d. For alfalfa, red clover, or sweet clover, minimum seeding of 8 pounds per acre will produce good results. Perennial grasses should be seeded not less than rates recommended by the U.S. Department of Agriculture.

Because sweet clover does not perpetuate itself well after the 2nd year, it's not recommended for pheasant nesting cover on plots to be diverted more than 2 years. Sweet clover can be used if other legumes are planted with it.

e. Seeding the nurse crop and accompanying legumes and grasses should be completed by May 10. This is so the nurse crop will grow sufficiently by nesting time.

f. If noxious weeds become a problem and they are scattered in patches, spot clipping and cutting may be done. A clipping height of 6 inches or more should be used to prevent killing nesting hens or young birds. If herbicide is used, follow the manufacturer's directions carefully.

g. The entire nurse crop should be clipped only if the legume and perennial grasses are endangered by shading or smothering. To allow game birds to hatch, clipping or removal of the nurse crop should be delayed until after July 20 on retired land.

2. *Second and Subsequent Years*

a. Nesting pheasants prefer sites having the previous year's vegetation. Therefore if it's not clipped, permanent cover will be most beneficial.

b. Scattered patches of noxious weeds can be controlled by clipping or judicial use of herbicides. Clipping the whole acreage is seldom necessary. If the land will be used for agriculture the following year, plow under the cover crop after July 30. However, wait as long as possible.

3. *Delayed Mowing Practices*

So pheasants can complete their nesting, delay mowing until July 20 on retired nesting cover, roadside ditches, and "odd" corners not needed for hay.

4. *Protection Against Grazing*

Domestic animals should not overgraze diverted acres. Marginal farmland should be fenced to prohibit grazing animals from destroying nesting cover and hastening soil erosion.

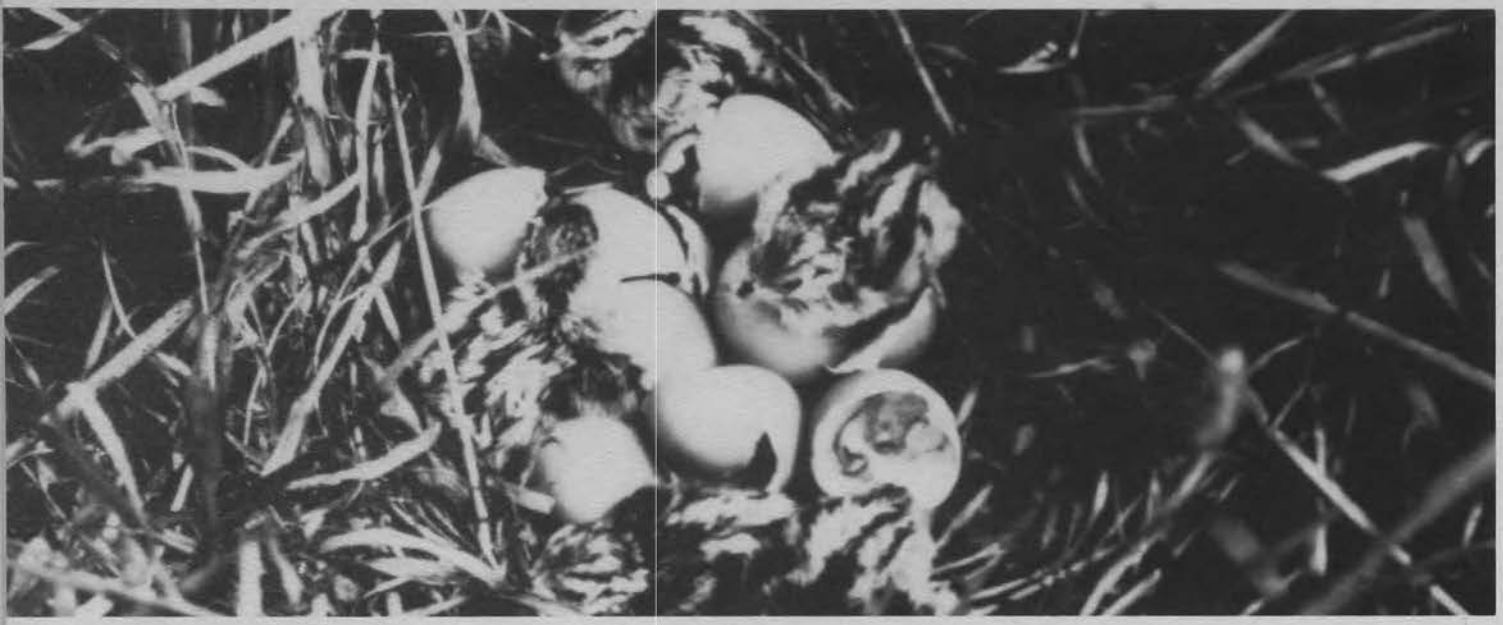
B. Winter Food

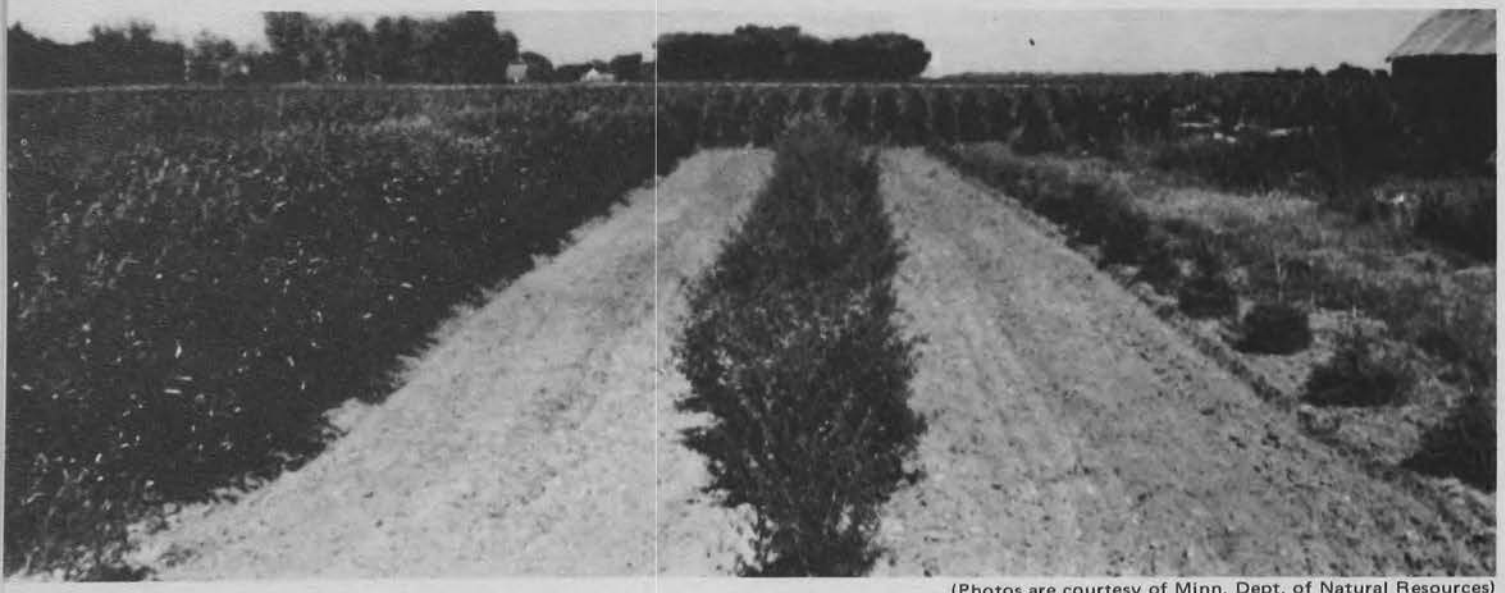
1. *Food Plots*

Generally in Minnesota, pheasants' need for food patches increases from south to north. Corn is the most effective winter food where it can grow to maturity.

One to 2 acre food patches are sufficient for the average farm. If large winter concentrations of deer occur, larger tracts are needed. Electric fences can discourage deer from depleting the winter food plot early in the season.

Other wildlife foods in order of their winter food value are: soy-





(Photos are courtesy of Minn. Dept. of Natural Resources)

Top: Most pheasants will hatch in early July. Nesting may occur as early as mid-April, and the egg laying peak occurs in mid-May. Middle: Pheasants will seek cover under the larger trees shown in the back of this shelterbelt. Lower: Cover plantings should be near feeding areas.

beans; sorghum; sunflower; flax; buckwheat; and small grains.

Essential requirements of food plots are:

a. a patch less than 1/2 mile from good winter cover, and;

b. food throughout the winter. Otherwise, desired game species will eat less-nutritious food. In a weakened condition, they may be lost from exposure or predators.

2. *Winter Feeding*

Where food plots are impractical, miniature cribs can be built where the wind will keep them free of snow. A hogwire crib 3 feet in diameter and 4 to 5 feet high can be filled with ear corn. The corn should be replenished throughout the winter. If it isn't, pheasants will leave the area or be weakened.

C. Winter Cover

In the past, winter protection was provided by sloughs and wetlands, farm woodlots, groves, shelterbelts, "odd" corners, and fencelines with natural thickets of brush, shrubs, and trees. Wetland drainage, clean farming, use of herbicides, and maturing and cutting of trees have created a loss of winter cover.

1. *Farmstead Shelterbelts and Woodlots*

In addition to providing winter cover, a good shelterbelt or woodlot will prevent wind and water erosion, reduce heat loss from farm buildings, prevent snow buildup in farmyards, protect domestic animals in feedlots, and beautify the farmstead. Rabbits, squirrels, songbirds, and other wildlife also benefit.

A shelterbelt should contain a minimum of 10 rows of trees and shrubs. The center plantings should have at least 4 rows of low-growing conifers such as spruce and cedar. Shrubs and trees planted on the outside of the shelterbelt provide loafing areas for pheasants during all seasons. They also serve as a snow catch in winter. A shelterbelt design is shown in figure 6.

Small, decorative groupings of spruce or other dense evergreens in protected locations (such as the south side of the farmstead) are attractive. They can be lifesavers if severe storms force birds to move from the main windbreak.

2. *Woody Cover Plots*

Besides providing a critical habitat requirement for pheasants, winter cover controls soil erosion, protects stream banks, conserves surface water, and beautifies the landscape.

Plantings should be large. Woody sites should be at least 150 feet from north to south, but there is no need to exceed 300 feet. The center of the plot should be evergreens such as red cedar (juniper), Black Hills spruce, or white spruce. These provide good shelter from wind and snow. Of the three evergreens, red cedar is the hardiest and has the fastest growth. Cedars and spruce are better than pine which grows too tall and open to give pheasants good ground protection.

Use deciduous trees sparingly. They provide perches and nesting sites for hawks and owls which may prey on game species.

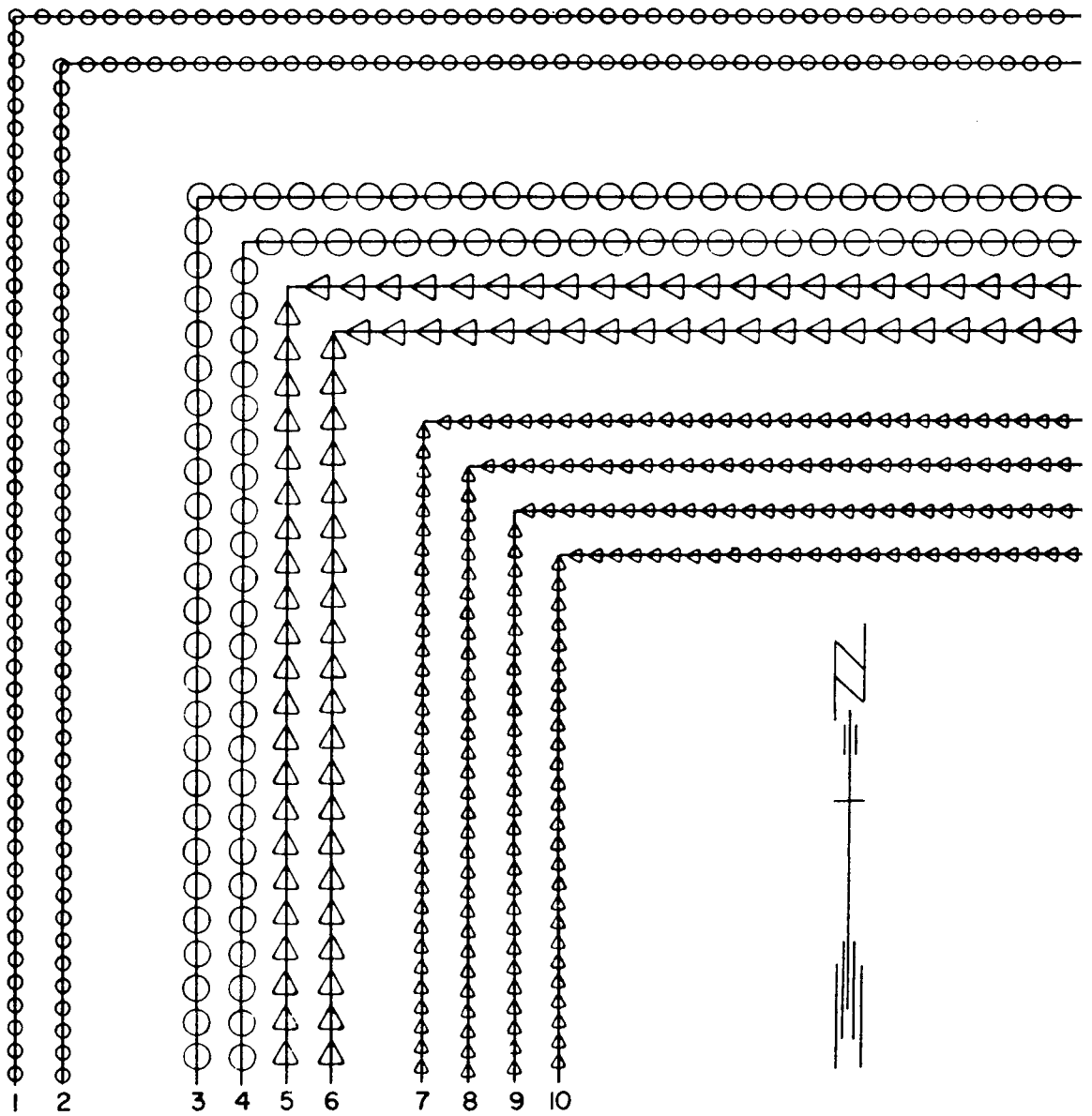
Wild plum, a small shrubby tree, grows well in the prairie region. It provides a dense thicket around the evergreens. Several rows of honeysuckle around the perimeter form a hedge and serve as a snow catch. Other shrubs, such as ginnala maple, buffaloberry and Russian olive, can also be used.

Cover plantings are most effective when they're near feeding areas and natural cover such as a marsh or grove of trees. South-facing slopes are especially desirable planting sites. They provide additional warmth from the sun and protection from prevailing winter winds. Pheasants are least likely to use cover plots on exposed hills or ridges.

A block design is shown in figure 7.

Shrubs are also helpful border plants for fields. Although they are not wide enough to give adequate protection during severe winter

Figure 6. Design for a typical shelterbelt



Rows 1 & 2 Shrubs – honeysuckle, lilac, buffaloberry, caragana, ninebark, or sand cherry. Plant shrubs 2-3 feet apart within the row.

Rows 3 & 4 Shrubby Trees – American plum, Russian olive, nannyberry, or highbush cranberry. Plant shrubby trees 5-6 feet apart within the row.

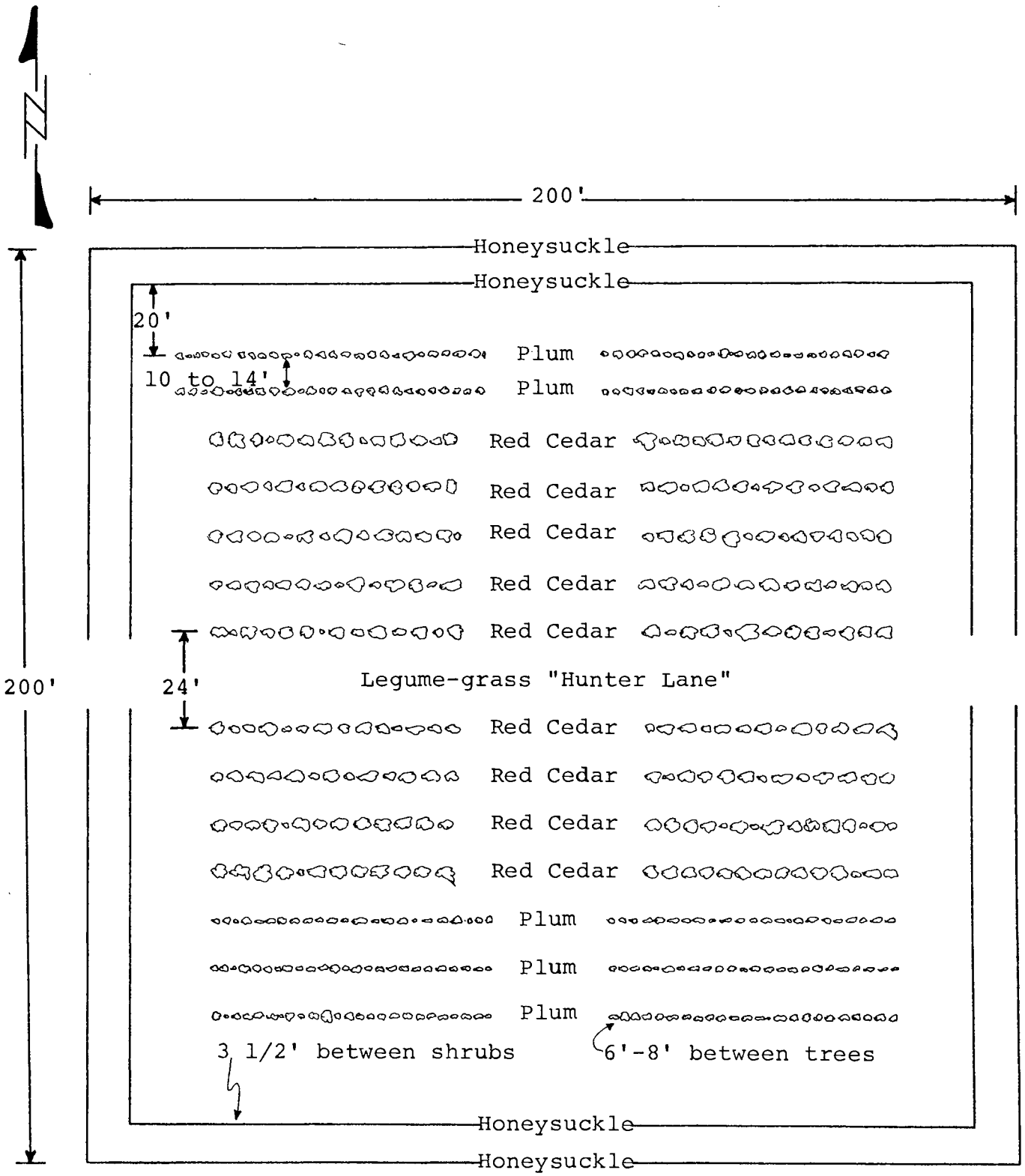
Rows 5 & 6 Tall Evergreens or Deciduous Trees – Norway (red) pine, ponderosa (western yellow) pine, white pine, hackberry, or ash. Plant tall evergreens or deciduous trees 8-10 feet apart within the row.

Rows 7, 8, 9, 10 Medium Evergreens – Black Hills spruce, white spruce, red cedar, Colorado spruce, or white cedar. Plant medium evergreens 8 feet apart within the row.

Spacing between rows should be 12 to 14 feet depending upon equipment used to cultivate the planting.

Deciduous trees, such as maple, elm, willow, cherry, and poplar, although used extensively, are often damaged by rabbits during their first years of growth.

Figure 7. Design for a block wildlife planting



(Minn. Dept. of Natural Resources)

Delayed mowing reduces damage to pheasant and duck nests. If possible, don't mow hay until July 15.

storms, border plantings provide resting areas, travel lanes, and escape routes.

Suggested Reading

(Refer to list at end of this publication):

10. Wildlife Habitat Improvement
15. Native Trees and Shrubs of Value for Planting in Minnesota to Provide Nuts and Fruits for Wildlife
25. Recommendations for a Scattered Wetlands Program of Pheasant Habitat Preservation in Southeast Wisconsin

D. Pheasant Egg Salvage

When pheasant nests are destroyed by mowing, eggs can be salvaged and artificially incubated. If eggs are not damaged and it is determined the hen will not return, eggs can be incubated immediately. Normal incubation time is 23 to 24 days at 100° F. and 50 to 55 percent relative humidity. Chicken incubators can be used. Instructions for use and construction of simple incubators can be found in "From Egg to Chick" (reference 13 at the end of this publication).

E. Raising and Releasing Chicks

It's interesting to raise and release pheasant chicks obtained from private and government sources. When combined with habitat improvement projects, this can be a valuable educational experience.

This type of program has limitations, however. From the standpoint of game management, raising and releasing chicks is justified only as:

1. A method to introduce birds to a newly created habitat management unit to reestablish a local population. After a breeding population has been established, releasing can be discontinued.

2. A method to supplement a depleted population where good habitat exists. This is a rare need. It can exist when a severe winter storm has depleted wild brood stock.

3. An expensive "put and take" method to provide birds for hunters. Without adequate nesting cover, winter cover, and winter food, released pheasants will not survive to reproduce the next year.

Because of these considerations, raising and releasing pheasant chicks should be accompanied by a habitat improvement project.

After a habitat plan has been developed, ask the State Department of Natural Resources' local Area Game Manager to review the plans. December or January is a good time.

The following procedures are essential to successful pheasant raising:

1. Raising facilities should be inspected by the Area Game Manager before birds are received. The facilities should conform to these specifications:
   a. An adequate chick battery brooder or a 10 x 12 foot brooder house;
   b. Outside pens large enough to provide 20 square feet per bird. One-inch mesh poultry fencing should cover and surround the pen area. The side fencing should be buried 6 inches into the ground.
2. At least 26 percent protein food must be fed.
3. Begin with no more than 50 chicks.
4. Keep complete records of the operation. Sample record forms are shown in figures 8 and 9.

Suggested Reading

(Refer to list at end of this publication):

16. Pheasant Raising and Releasing Instructions
23. Pheasant Release Program of the Minnesota FFA

Figure 8. Sample game bird raising and releasing report

Date _____

Name of Member _____ Age _____

P.O. Address _____ County _____

1. Number of day-old birds received _____ Total cost _____

   Source (state, or name of private game farm) _____

2. Number of wild eggs salvaged _____

3. Number of wild eggs hatched _____ (Federal permit required for ducks)

4. Pounds of feed consumed _____ Total Cost _____

5. Total number of birds released _____

   (Numbers)

6. Major reasons for losses: Shipping _____

   Unknown _____
   Carelessness and Predators _____

7. Percent protein game bird feed used _____

8. Swimming water provided (at least 4 square feet for ducks) _____

9. Pen area provided (at least 20 square feet per pheasant and at least 5 square feet per duckling) _____

10. Predator proof fencing provided Yes ☐ No ☐

11. Cooperating agencies and extent of cooperation (percent of cost paid for birds, feed,or habitat improvement.)

Organization	Extent of cooperation
_____	_____
_____	_____
_____	_____

12. Release site _____

13. Posted against hunting Yes ☐ No ☐

14. Remarks (include photos of raising facilities if possible) _____

_____

_____

Figure 9. Sample habitat improvement project report

Date _____

Name of Member _____ Age _____

P.O. Address _____ County _____

Area Game Manager _____

PROJECT

	No. of sites	Total acres	Date seeded	Type of cover planted
1. Seed diverted acres by May 10th.				

	Number of sites	Acres
1a. Did not mow or plow diverted acres before July 15th.		

	Acres
2. Delayed roadside ditch mowing until July 15th.	

	No. of sites	Acres	Cover type burned
3. Spring or fall burning			

3a. Reason for burning _____

	Species	No.	Species	No.	Species	No.
4. Shrubs planted						
Conifers planted						
Trees planted						

No. of woody cover sites _____ Acres _____

	Acres	Acres	Acres
5. Food plot planted for winter wildlife food	Corn _____	Sorghum _____	Other _____

	How improved	Acres
6. Improved marsh areas	Dike	
	Dam	
	Blasting	
	Dugout	
	Fenced from grazing	
	Preserved an existing marsh	

	Nesting boxes	Nesting baskets	Loafing sites	Other
7. Built wildlife structures (number)				

8. Forest or woodlot improvement:

How improved	No. of sites	Acres
Clear-cutting		
Selective cutting		
Browse cutting		
Other		

9. Other habitat projects _____

10. Remarks (include before and after photos of your project if possible) _____

Both upland game birds and dabbling ducks like to nest in hayfields.

(Minn. Dept. of Natural Resources)

II. SHARP-TAILED GROUSE-PRAIRIE CHICKEN PROJECTS

Plant SUCCESSION is the most important management factor for any Minnesota upland game bird. To support a specific population in any area, maintain a certain stage of succession in the ever-changing plant communities.

The prairie chicken (which is extinct in much of its former Minnesota range) requires open prairie with few or no woody plants. The sharptail requires intermixed open prairie and brushland.

Before settlement and agriculture came to Minnesota, the sharptail grouse was the dominant upland game species on the original prairie.

As primitive agriculture replaced portions of original hardwood forests with crops (and thereby altered the succession of natural vegetation), the prairie chicken replaced the sharptail.

Then agriculture became more intensified. The prairie chicken's need for extensive grasslands was no longer met. As a result, the species began to decline in population and distribution.

Land manipulation and plant succession are now at the stage where Minnesota sharptails and prairie chickens are limited to small areas. Such areas still contain remnants of open prairie and border a second-growth hardwood forest.

Thus, sharp-tailed grouse-prairie chicken management practices should include cutting or burning maturing woodlots. This maintains the proper stage in plant succession.

Wildlife authorities say the smallest practical management unit is 2,000 acres for sharptails and 5,000 acres for prairie chickens. However where these birds still exist, habitat projects can be undertaken in smaller areas.

A. Nesting Cover

1. *Diverted Acres*

Establish 1st-year nesting cover the same way as for pheasants except for these changes:

a. For the perennial or biennial legume grass crop, red top or timothy can be substituted for bromegrass;

b. Legumes other than sweet clover should be used. Sharptails prefer lower, more open cover. Only grasses should be planted for prairie chicken nesting cover. Mixtures of switchgrass, crested wheatgrass, bluestem, and other prairie grasses are preferred.

Nesting cover management for second and subsequent years is the same as for pheasant projects.

2. *Delayed Mowing Practices*

This procedure is the same as for pheasants.

3. *Protection Against Grazing*

This procedure is also the same as for pheasants.

B. Winter Food

Corn and small grains are eaten by prairie chickens throughout winter. A food patch left standing during winter months can be highly beneficial. Sharptails also need supplemental foods when deep snow covers standing crops. A portion of the crop, therefore, should be shocked or stacked for food.

C. Winter Cover

Prairie chicken habitat is characterized by large, open tracts near the prairie edge. Winter cover plantings for this species can be combined with soil erosion control and water retention practices. On marginal areas such as eroded gullies or ridges, small shrubby trees can be planted to provide winter cover.

Winter cover is usually adequate in established sharptail range. However to maintain a desirable stage in plant succession, controlled burning or selective cutting of overmature, nonmarketable tree species can be implemented. However, consult the local game manager and area forester before doing this.

Suggested Reading

(Refer to list at end of this publication):

8. Prairie Grouse
10. Wildlife Habitat Improvement
20. Sharptailed Grouse in Minnesota

III. WATERFOWL PROJECTS

A. Nesting Cover

1. *Ground Nesting Ducks*

Under diverted acres and land retirement programs, management of upland nesting cover is the same as for pheasants.

To provide the greatest benefit to dabbling ducks such as the mallard and teal, legume-grass mixtures should be less than 1/2 mile from shallow water areas retaining water all or most of the summer.

Between nesting cover and open water and especially along fence rows, narrow strips of grasses could be seeded and left unharvested. Besides providing safe travel lanes for the hen and her brood, the strips provide nesting cover and escape routes for other small game.

Because dabbling ducks prefer lower and more open nesting cover than do pheasants, legumes other than sweet clover should be seeded.

In central and southern Minnesota, nesting baskets have been of little help to mallards. This is because of crows' egg predation. However in North Dakota, mallards have used nesting baskets with high success. Since crows do not normally range into open prairies of North Dakota and extreme western Minnesota, nesting baskets should increase density of breeding mallards there.

Suggested Reading

(Refer to list at end of this publication):

27. New Homes for Prairie Ducks

2. *Tree Nesting Ducks*

Goldeneyes and wood ducks nest in hollow trees or in nesting boxes. Goldeneyes nest along shores of the larger fish lakes in northeastern Minnesota. Wood ducks nest throughout the state in wooded habitat near water.

For both species, galvanized metal or wooden nesting boxes should be placed at least 15 feet above the ground and within 1/4 mile from water. The correct design should be followed. Otherwise, the nesting box may admit predators such as raccoons. Plans and additional reading are included in the following publications listed at the end of this publication:

14. How to Build a Nest Box

16. Improved Nest Structures for Wood Ducks

B. Wetland Development Projects

Shallow water areas provide adult waterfowl with a place to court and breed. These areas also provide food and cover for the adult waterfowl and their ducklings. Dabbling ducks prefer ponds or wetlands with a good fringe of emergent vegetation to provide cover for young ducklings. Emergent vegetation is essential for diving ducks' nesting sites.

Minnesota wetlands have been classified into the following five types:

Type I – seasonally flooded basins or flats

Shallow depressions, usually without vegetation, that contain water for short periods in the spring. Most of these areas are cultivated wetlands that were once Type II. Typical summer vegetation includes foxtails, smartweed, barnyard grass, and redtop.

Type II – fresh meadows

Shallow depressions holding water up to 12 inches deep after spring runoff, but generally losing surface water by June. The rest of the season the soil remains saturated within a few inches of the surface. Vegetation is characterized by sedges, whitetop grass, and bur-reed.

Type III – shallow fresh marshes

Marshy depressions containing up to 12 inches of water until June or early July, after which they may lose most surface water. However, the soil remains waterlogged the rest of the growing season. These areas have insufficient water depth during the growing season to prevent invasion by emergent vegetation. Typical plants are bulrush, cattail, whitetop grass, and sedges.

Type IV – deep fresh marshes

Marsh areas similar to Type III, but with sufficient depth during the growing season to have open water. This open water generally supports submerged aquatic plants.

Type V – open fresh water

Open water area with emergent vegetation restricted to a narrow border.

Ducks prefer Type IV wetlands. Such wetlands provide the best breeding and feeding habitat. Ducks use Type V areas to brood in midsummer and late summer when less permanent marshes begin to dry out.

1. *Preserving Existing Wetlands*

Protect all wetlands from further ditching and draining. Type IV wetlands, especially, should also be protected from grazing. This can be done by fencing the perimeter. Alternate watering sites can be provided for domestic animals. Fencing can insure light grazing or no grazing on adjacent nesting cover. A marsh or slough should never be burned except when brush and shrub have made the shoreline useless for waterfowl.

2. *Creating Wetlands*

Wetland areas can sometimes be created or restored by water control structures. Wetland types I, II, and III, that are presently too shallow or which lack water entirely during much of the summer, can be improved by a structure. A grass border should be maintained around these wetland developments to provide nesting cover and to prevent erosion.

Open water may be created in dense marsh vegetation by a dragline or by blasting. A dragline will do an excellent job where large accessible areas are to be developed. When smaller areas are to be restored or where the site is not accessible to a dragline, blasting is suggested. Use of ammonium nitrate and fuel oil (AN/FO) explosives is an inexpensive method of improving many marsh areas. However, blasting should never be attempted without the advice and help of professionals.

Dugouts must contain at least 500 square feet, but 1500 square feet is preferred. Dugouts should be built in groups of at least five and located near a permanent

Emergent vegetation along the shoreline offers food and cover for ducklings.

waterfowl marsh or lake. The average depth should be 2 to 3 feet with a maximum depth of 5 feet. Gradually sloping shorelines are most desirable. Deep holes with steep banks have little value.

A Soil Conservation Service technician will make a feasibility check to determine if a project is eligible for ASCS cost-sharing. The SCS can also provide engineering services. The area game manager must approve the project when assistance is provided by the Minnesota Department of Natural Resources.

3. *Providing Loafing Sites*

Ducks use sites such as muskrat houses to loaf, preen their feathers, and congregate. In some cases, diving ducks and grebes may use these dry areas for nesting sites. On newly created or on old, deficient water areas, floating or stationary loafing sites can be constructed. Structures may range from elaborate floating rafts to simple cut logs.

Suggested Reading

(Refer to list at end of this publication):

10. Wildlife Habitat Improvement
11. Blasting with Ammonium Nitrate-Fuel Oil Mixture for Improving Marsh Habitat
24. Pothole Blasting for Wildlife

C. Duck Egg Salvage

This procedure is the same as for pheasants. Days required for incubation depend upon the length of time the eggs were incubated by the hen.

A federal permit must be obtained to incubate and hatch wild duck eggs. Contact the local conservation officer (game warden) to obtain the permit.

Suggested Reading

(Refer to list at end of this publication):

13. From Egg to Chick

D. Raising and Releasing Mallard Ducklings

Raising and releasing mallard ducks has been extremely popular. Combined with a habitat improvement project, it can be a valuable educational experience.

However, this type of program has limitations. From the standpoint of waterfowl management, raising and releasing ducklings is justified only as:

1. A method to introduce birds to a newly created habitat management unit to reestablish a local population;
2. A method to supplement a depleted population where good habitat exists;
3. An expensive "put and take" method of providing birds for hunters. Without adequate nesting cover and wetland areas, ducks cannot maintain a naturally self-sustaining population.

Because of these three considerations, raising and releasing mallard ducklings should be accompanied by a habitat improvement project. After a habitat plan has been developed, consult the State Department of Natural Resources' local Area Game Manager to review the plans. December or January is a good time.

The following procedures are essential for successful mallard raising and releasing:

1. The raising facilities should be inspected by the Area Game Manager before receiving birds. The facilities should conform to these specifications:
   a. A 10 x 12 foot brooder house should be provided.
   b. Outside pens should be large enough to provide 5 square feet per bird. One-inch mesh poultry fencing should cover and surround the pen area. The side fencing should be buried 6 inches into the ground.
   c. A swimming area at least 4 feet square and 6 inches deep should be provided.
2. At least 26 percent protein food should be used.
3. Ducklings should be released in Type III, IV, or V wetland areas or in other areas approved by the local game manager.
4. Each unit should be limited to 30 ducklings.
5. Keep complete records. Sample record forms are shown in figures 8 and 9.

Suggested Reading

(Refer to list at end of this publication):

5. A Minnesota Guide to Raising and Releasing Mallards
22. Mallard Release Program of the Minnesota FFA

IV. DEER AND RUFFED GROUSE PROJECTS

A. Northern Forested Area

Generally, white-tailed deer and ruffed grouse requirements overlap. A habitat and timber management program geared to either one will usually benefit the other.

1. *Timber Harvest – Even-Age and Selective Cutting*

Owners of small tracts (50-100 acres) can produce the best wildlife habitat by cutting to develop even-age blocks on three-fourths of their land and by selectively cutting the remaining one-fourth.

Even-age management is clear-cutting to establish trees of different ages in separate blocks. In selective cutting management, only trees of a certain age (or species) are harvested. This results in a mixed stand of large, medium, and small trees.

Figure 10 shows an aspen even-age cutting program to benefit ruffed grouse. Each cutting block is 5 acres (330 x 660 feet). If larger areas are cut for economic reasons, the blocks should be longer from north to south, but not wider from east to west. Whenever possible, keep male aspen rather than female trees. The flower buds of male aspen are almost exclusively preferred by grouse as a winter food source.

Clear-cutting aspen stands, together with their understories where balsam fir occurs, also provides much deer browse from regenerating young sprouts. Whitetails will not fully use cuttings larger than 40 acres. The value of aspen sprouts for deer is highest the first 3 to 5 years.

Table 2 illustrates initial aspen cuttings per square mile to meet the needs of the estimated deer population.

In most areas of Minnesota, a 20- to 40-acre cut per square mile of forest is adequate once every 3 to 5 years. Cut close to known or potential winter deeryards.

2. *Controlled Burning*

In many cases, controlled burning is better than clear-cutting because wood ashes add nutrients to the soil. Burning also removes ground litter and slash. These are obstacles to deer and grouse. Burning stimulates browse species such as cherries, dogwood, blueberries, and many others.

Controlled burning should never be attempted without supervision by professional wildlife and forestry personnel.

3. Reforestation

The following practices benefit wildlife and are recommended if reforestation is planned:

a. Plant several species of conifers to produce diverse cover;

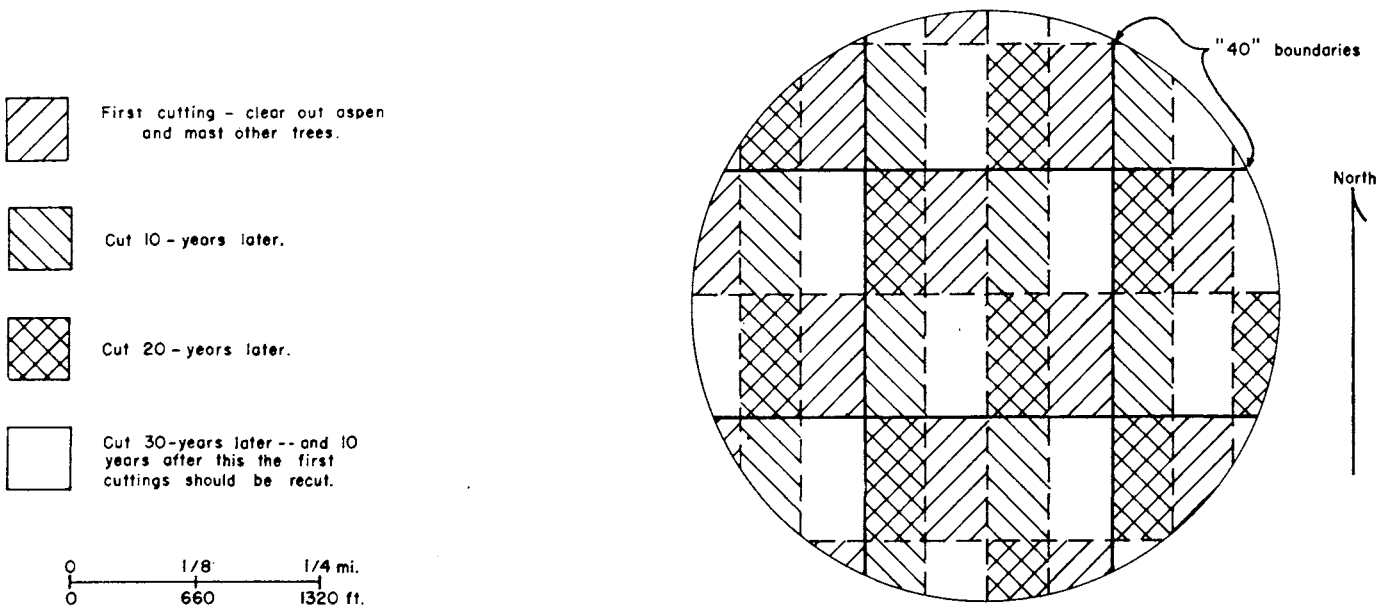
b. Intersperse cover types by replanting in small blocks. Leave strips between plantations. This will benefit

Table 2. Clear-cut openings recommended for deer and ruffed grouse

Population of Deer (per square mile)	Recommended Area to be Cut (per square mile)
11 to 20	20 acres or more
21 to 30	40 acres or more
31 to 40	100 acres or more
41 to 50	200 acres or more

Figure 10. Even-age cutting program for aspen

This is an idealized aspen cutting program to benefit ruffed grouse. Each cutting block is 5 acres (330 x 660 feet). If larger areas need to be cut for economic reasons, they should be longer north and south, but not wider east and west. Leave scattered clumps of birch and/or ironwood. The presence of other tree species within the clear-cut area decreases the value of the habitat for these birds and will suppress aspen regeneration. Cutting programs should favor male aspen clones in preference to female clones.



wildlife and reduce danger of widespread crown fires in conifer plantations;

c. Create wildlife openings by planting clover on trails and firebreaks in the area cleared for reforestation;

d. If openings cannot be maintained, reserve a buffer zone so trees can grow between the planted area and the natural stand.

4. *Special Practices*

For species of wildlife which have a small home range (such as ruffed grouse), small landowners can often provide all habitat requirements. For game with a large home range (such as deer), a landowner may not be able to supply all requirements. But he could still improve conditions by the following practices:

a. Openings – On small tracts of land, 5 or 6 open fields of 1/2 to 1 acre can be legumes. The fields are mixed with 80 acres of wooded area. This provides an ideal habitat management unit for grouse. This combination is also ideal for white-tailed deer.

Small fields in stands of large conifers are not recommended for grouse. Such openings may allow hawks and owls to conceal their attacks on birds using the open areas.

Cutting and burning openings have already been described. Bulldozing and herbicide spraying are two other techniques. Herbicides should be used cautiously because of potential danger to wildlife.

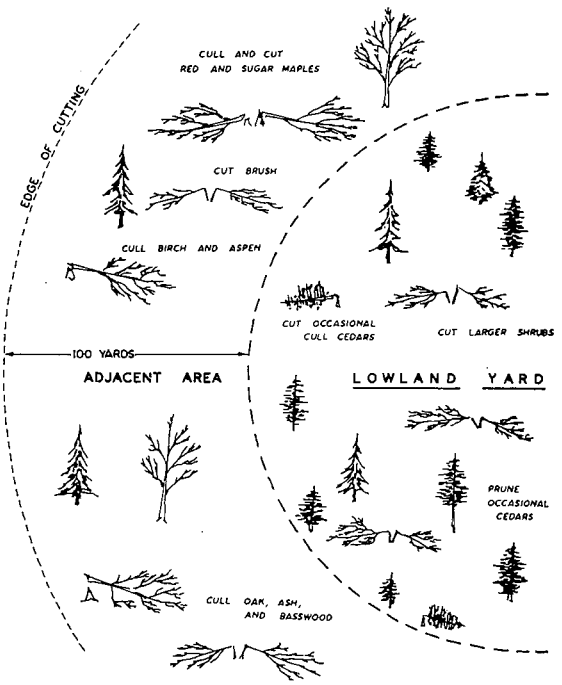
b. Trails – Trails provide another form of opening. They improve game habitat, provide hunter access, and aid in game harvest.

A good place for a trail is across a south-facing slope just above a brushy (alder or willow) lowland. Here it will provide dusting and sunning areas for grouse, encourage growth of food-producing plants, and provide a place where snow will pile deeply for a safe snow burrow roost. Such a trail increases hunters' chances to flush grouse coveys before these birds move to the uplands in late fall.

c. Emergency Winter Care of Deer – If the land contains a traditional wintering "deeryard," cutting natural browse in and around the yard is the best method to increase the deer food supply. Cutting will provide food for immediate use and will stimulate stumps to sprout. Thus, food conditions are improved for future years.

Minnesota yarding areas are divided into three types: white cedar swamps; other lowland yards; and upland yarding areas.

Figure 11. Improvement of lowland deer yarding areas



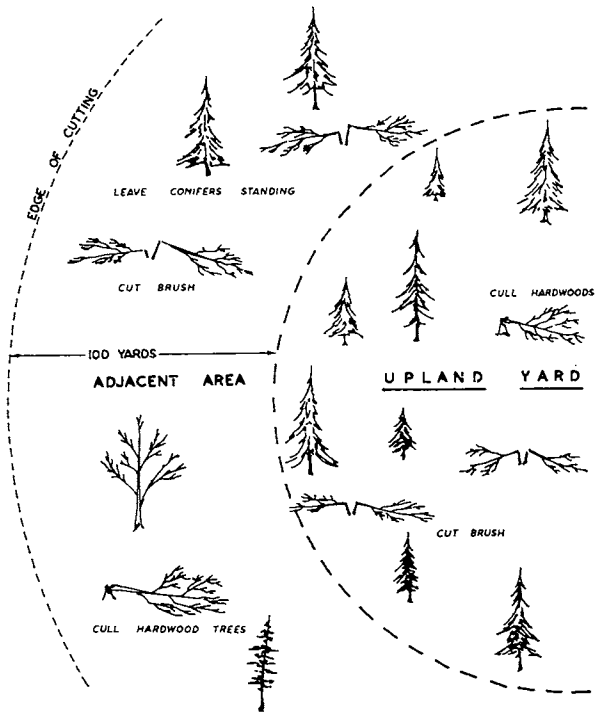
DO NOT CUT BALSAM, PINE, SPRUCE, ALDER, HAZEL, OR COMMERCIAL TIMBER.

Deeryard improvement through winter browse cutting in lowland yarding areas having white cedar or balsam cover.

White cedar swamps are traditionally where deer concentrate in winter. Some of these swamps have been so heavily browsed that they now provide little preferred deer food. Cutting cedar trees which are deformed, crooked, rotted, and which otherwise are not marketable can help. Cutting brush and young hardwoods can also be helpful, but this should be done within 100 yards of the yard's upland edge (see figure 11).

Upland yarding areas are dense stands of balsam fir or other conifers which provide winter cover. Enough hardwoods are within or along the edges of the areas to provide winter food. Hardwood cuttings should be made in

Figure 12. Improvement of upland deer yarding areas



DO NOT CUT EVERGREENS, HAZEL, OR COMMERCIAL TIMBER.

Deeryard improvement through winter browse cutting in upland yarding areas of balsam, spruce, or pine.

and along the edge of such conifer stands. The balsam fir is of greater value as cover than as food (see figure 12).

Other lowland deeryards are primarily balsam trees which provide cover and some food. Within and around such yards' perimeters, cutting hardwoods, birch, and brush will increase the food supply.

When cutting emergency browse, use these procedures.

White cedar – Since this species seldom regenerates, only a few branches should be pruned from commercial-quality trees. Crooked, hollow, or rotted trees may be cut.

Brushy plants – For mountain maple, red osier dogwood, other dogwoods, willow, elderberry, and sumac, cut all stems having no usable deer browse from ground level to a height of 5 feet. These stems – usually 1 inch or more in diameter – should be cut as close as possible to the ground or snow. If they are still beyond the reach of deer, the tops should be completely felled and trimmed.

Browse trees – Heavy stands or multiple stems of white birch, red maple, sugar maple, aspen, oak, basswood, or ash can be thinned. Cut unmarketable trees first.

Do not cut alder, hazel, or evergreens other than white cedar. Alder is starvation food and hazel is only rated fair.

B. Agricultural Areas

Where agricultural lands are by mixed stands of basswood, sugar maple, elm, and oak, the woodlots should be managed intensively for both wood and wildlife.

1. *Timber Harvest*

To manage oak for game:

a. Insure a continuing supply of 40- to 80-year-old vigorous, full-crowned oaks. At least 15 oaks, averaging 14 inches in diameter at breast height, are necessary per acre for high acorn production;

b. Allow 10 oaks per acre within a mile of deeryards – the total acreage should be equivalent to the number of deer in the yard or to the size of the yard;

c. Leave a ratio of three red oaks to one white oak (bur oak in Minnesota) near deeryards and two red oaks to one white oak in summer range;

d. Leave the oaks at higher elevations. Cut those on lower sites to reduce chance of frost damage to acorn production.

2. *Winter Food*

In intensive agricultural areas, corn is a favored deer food. The same winter food patches planted for pheasants may be used by deer. If this is the case, larger food plots should be used.

3. *Winter Cover*

Woody cover plots recommended for pheasants may be used by whitetails. Local deer populations can increase if a diversity of food and cover exists.

Suggested Reading

(Refer to list at end of this publication):

2. Forest Game Habitat Improvement
4. Trees in Minnesota
6. Minnesota Plan for Emergency Winter Care of Deer and for Deer Yard Improvement
10. Wildlife Habitat Improvement
15. Native Trees and Shrubs of Value for Planting in Minnesota to Provide Nuts and Fruits for Wildlife
17. Recommendations for Management of Ruffed Grouse Habitat in Northern Minnesota

V. RECOMMENDED READING LIST OF LITERATURE CITED

A. Publications available from:

Documents Section
Room 140 Centennial Building
St. Paul, Minnesota 55155

Purchase price necessary. Payment including sales tax must accompany order. Sales tax is in addition to prices listed.

1. "Big Game in Minnesota." 1965. Department of Natural Resources Technical Bulletin No. 9. 231 pp. $2.50
2. "Forest Game Habitat Improvement." 1969. Department of Natural Resources Technical Bulletin No. 10. 68 pp. $1.50
3. "Key to Common Aquatic Plants." 1970. Department of Natural Resources. $1.50
4. "Trees in Minnesota." Department of Natural Resources. 64 pp. $.50

B. Publications available from:

Bureau of Information and Education
Minnesota Department of Natural Resources
Centennial Building
St. Paul, Minnesota 55155

No purchase price necessary.

5. "A Minnesota Guide to Raising and Releasing Mallards." Division of Game and Fish. 12 pp.
6. "Minnesota Plan for Emergency Winter Care of Deer and for Deer Yard Improvement." 1965. Division of Game and Fish. 12 pp.
7. "Rugged Ringneck of Minnesota." 1967. 24 pp.
8. "Prairie Grouse." Conservation Information Bulletin No. 1. Upland Game Birds III. 5 pp.
9. "The White-Tailed Deer." Minnesota Big Four – Part 4. 8 pp.
10. "Wildlife Habitat Improvement." 1969. Division of Game and Fish. 13 pp.
11. "Blasting with Ammonium Nitrate-Fuel Oil Mixture for Improving Marsh Habitat." Information leaflet No. 85. 5 pp.
12. "A Discussion of Ruffed Grouse Management Problems in Minnesota." Information leaflet No. 89. 11 pp.
13. "From Egg to Chick." 1964. University of Illinois Circular No. 848. 16 pp.*
14. "How to Build a Nest Box." Information leaflet No. 31. 4 pp.
15. "Native Trees and Shrubs of Value for Planting in Minnesota to Provide Nuts and Fruits for Wildlife." Information leaflet No. 94, 4 pp.
16. "Pheasant Raising and Releasing Instructions." 5 pp.*
17. "Recommendations for Management of Ruffed Grouse Habitat in Northern Minnesota." Information leaflet No. 100. 3 pp.
18. "The Ringnecked Pheasant in Minnesota." Information leaflet No. 13. 4 pp.
19. "Ruffed Grouse in Minnesota." Information leaflet No. 14. 3 pp.
20. "Sharptailed Grouse in Minnesota." Information leaflet No. 15. 2 pp.
21. "The Whitetailed Deer in Minnesota." 2 pp.

D. Publications available from:

Minnesota Department of Education
Vocational-Technical Education Division
Capitol Square Building
St. Paul, Minnesota 55101

No purchase price necessary.

22. "Mallard Release Program of the Minnesota FFA." 1971.
23. "Pheasant Release Program of the Minnesota FFA." 1971.

E. Publications available from:

Wisconsin Department of Natural Resources
Madison, Wisconsin 53701

No purchase price necessary.

24. "Pothole Blasting for Wildlife." 1965. Publication No. 352.
25. "Recommendations for a Scattered Wetlands Program of Pheasant Habitat Preservation in Southeast Wisconsin." 1970. Research Report No. 63. 23 pp.

F. Publications available from:

United States Department of Interior
Bureau of Sport Fisheries and Wildlife
Federal Building, Fort Snelling, Minneapolis, Minnesota 55111

No purchase price necessary.

26. "Improved Nest Structures for Wood Ducks." 1966. Wildlife leaflet No. 458. 20 pp.
27. "New Homes for Prairie Ducks." (Nesting Basket plans.) 1970. Northern Prairie Wildlife Research Center. 6 pp.

G. Publications available from local book stores or library:

28. "American Wildlife and Plants, A Guide to Wildlife Food Habits." 1951. By Alexander C. Martin, Herbert S. Zim, and Arnold L. Nelson. Dover Publications, New York. 500 pp.
29. "Our Wildlife Legacy." 1954. By Durward L. Allen. Funk and Wagnalls Co., New York.
30. "A Sand County Almanac." 1949. By Aldo Leopold. Oxford University Press, New York. 269 pp.
31. "Wildlife Management and Conservation." 1964. By James B. Trefethen. D.C. Heath and Co., Boston. 110 pp.

H. Publications available from:

Conservation Department
Winchester-Western Division
Olin Mathieson Chemical Corporation
East Alton, Illinois 62024

32. "Ruffed Grouse." 1969. By John Madson. Winchester Press. 103 pp. $1.00
33. "The Mallard." 1963. By John Madson. Winchester Press. 80 pp. $1.00
34. "The Ringnecked Pheasant." 1969. By John Madson. Winchester Press. 104 pp. $1.00

**Available only from*
Division of Game and Fish
Minn. Dept. of Natural Resources
Centennial Building
St. Paul, Minnesota 55155

(Minn. Dept. of Natural Resources)

Pheasants need more food and better winter cover to increase in Minnesota. This bulletin suggests ways to meet the needs of pheasants and other wildlife.

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